A1250-1
11/4/87

NOVEMBER 2, 1987

CHEMICAL & ENGINEERING

NEWS

05111 79C098 9 K AR6544SL 1
CONGRESSIONAL INFO SERV-SRI
4520 EAST WEST HWY SUITE 800
SRI ACQUISITIONS
BETHESDA MD 20814

ANTARCTIC OZONE HOLE

Latest expedition reveals unexpected complexity

Page 22

CHEMICAL & ENGINEERING
NEWS
NOVEMBER 2, 1987

Volume 65, Number 44
CENEAR 65 (44) 1–56
ISSN 0009-2347

News of the Week

■ **Federal R&D budgets for fiscal 1988 are in peril from hurried efforts to reduce the federal deficit.** **Page 4**

■ **One of longest jury trials in history ends with $16 million punishment for Monsanto stemming from 1979 spill containing trace of dioxin.** **Page 5**

■ **Success with genetically altered mice that produce human protein eventually may lead to low-cost method of harvesting many important substances.** **Page 5**

■ **Chemical firms don't seem particularly worried by recent stock market plunge, although stock value of 10 chemical firms has fallen 26% since mid-October.** **Page 6**

Business

Chlor-alkali producers expand capacity, mostly through debottlenecking, to ease tight supplies and to meet strengthening demand. **Page 13**

Reinforced plastics use is projected to grow at an accelerated rate through the rest of the 1980s in a new Freedonia Group study. **Page 15**

Government

Occupational disease notification bill passed by House last month now goes to the Senate where it faces strong opposition. **Page 19**

Law that controls pesticide use in the U.S. does not protect health of users of home pesticide products, says Consumers Union. **Page 20**

Technology

USI Chemicals' facilities expansion more than doubles its polymer product R&D capabilities; EniChem enlarges its dimethyl carbonate-producing volume; Akzo has quaternary ammonium salts available as phase-transfer catalysts; new database eases information-gathering on federal regulations for chemical substances. **Page 27**

Awards

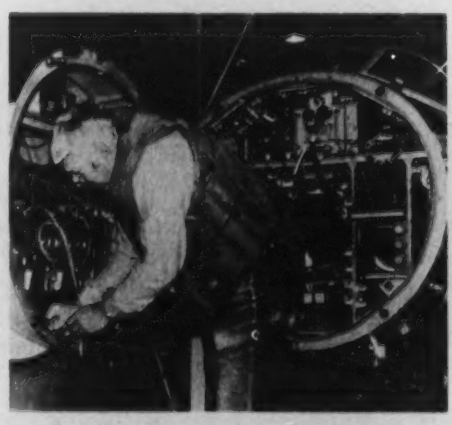
ACS award winners: Clark, Chisholm, de Gennes, Doyle, Escudero, Field, Fisher, Fox, Gardner, and Goddard. **Page 37**

Cover: Computer-generated map depicts satellite measurements of ozone above southern hemisphere on Sept. 27, 1987. At center of map is South Pole; Antarctica is outlined in white. Darkest colors at center represent unprecedented low levels of ozone in ozone hole. Photo courtesy of NASA

Letters 2

Concentrates
Business 7
Government 16
Science/Technology 21

The Departments
Books 31
ACS Focus 36
Meetings 54
Newscripts 56



Science

Preliminary data from NASA expedition suggest that both chlorine photochemistry and meteorological conditions contribute to seasonal Antarctic ozone hole phenomenon. **Page 22**

Chemical & Engineering News

1155—16th St., N.W., Washington, D.C. 20036
Editor: Michael Heylin
Assistant Managing Editors: David M. Kiefer, James H. Krieger, Janice R. Long, Donald J. Soisson, William J. Storck
Staff Editor: Ernest L. Carpenter
Senior Editors: New York: Earl V. Anderson; Chicago: Joseph Haggin; Washington: Lois R. Ember, Wilbert C. Lepkowski, Rebecca L. Rawls
Associate Editors: Stuart A. Borman, Mairin B. Brennan, Doron Dagani, Bette Hileman, Richard J. Seltzer, Pamela S. Zurer
Service Departments Editor: Dolores Miner
Editing Services: Joyce A. Richards (Head), Anne Riesberg (Editorial Assistant), Patricia Oates (Administrative Assistant)

News Bureaus: New York: (212) 697-3223 Stephen C. Stinson (Associate Editor), Marc S. Reisch (Assistant Editor). Chicago: (312) 256-4143 Ward Worthy (Head). Houston: (713) 973-8161 Bruce F. Greek (Head). Washington: (202) 872-4495 David J. Hanson (Associate Editor). West Coast: (415) 653-3630 Rudy M. Baum (Head). **Foreign Bureau:** London: (01) 540-0414 Dermot A. O'Sullivan (Head), Patricia L. Layman (Associate Editor)
Graphics and Production: Leroy Corcoran (Manager). Alan Kahan (Art Director). Barbara Fryer (Production/Art Director). Linda Mattingly (Staff Artist). Diane Kelly (Costing). **Business Manager:** Arthur Poulos
Circulation Development: Cynthia G. Smith

ADVISORY BOARD: William J. Bailey, Jacqueline K. Barton, Ernest L. Drew, Harry G. Drickamer, A. Nicholas Filippello, Myron Foveaux, Vincent L. Gregory Jr., Adam Heller, John D. Holmfeld, Donald F. Hornig, Isabella Karle, Dorothy Nelkin, Richard Nicholson, Howard A. Schneiderman, Ellen K. Silbergeld, Howard E. Simmons, William P. Slichter, Richard N. Zare

Published by
AMERICAN CHEMICAL SOCIETY
(202) 872-4600; TDD (202) 872-8733
John K Crum, Executive Director

PUBLISHING BOARD: Barbara G. Wood (*Chairman*); *Board of Directors Chairman:* Ernest L. Eliel; *President:* Mary L. Good; E. E. McSweeney; John H. Nelson; Louis D. Quin; and Jean'ne M. Shreeve
© Copyright 1987, American Chemical Society

Subscription Service: Send all new and renewal subscriptions with payments to: Director, Business Management Division, ACS, P.O. Box 57136, Washington, D.C. 20037. Correspondence and telephone calls for changes of address, claims for missing issues, subscription service, status of records and accounts should be directed to: Manager, Membership & Subscription Services, ACS, P.O. Box 3337, Columbus, Ohio 43210; (614) 421-3776.

For changes of address, include both old and new addresses with ZIP code numbers and mailing label from a recent issue. Allow four weeks for change to become effective. Claims for missing numbers will not be allowed if loss was due to failure of notice of change of address to be received in the time specified; if claim is dated (a) North America: more than 90 days beyond issue date, (b) all other foreign: more than one year beyond issue date; or if the reason given is "missing from files."

Subscription Rates 1987. Printed editions: nonmembers U.S. 1 yr. $44, 2 yr. $75, outside U.S. 1 yr. $70, 2 yr. $127. Air freight rates available on request. Rates above do not apply to nonmember subscribers in Japan, who must enter subscription orders with Maruzen Co. Ltd., 3-10 Nihonbashi 2-chome, Chuo-ku, Tokyo 103, Japan. Tel: (03) 272-7211. Single copies: Current $6.00. Rates for back issues and volumes are available from Microforms & Back Issues Office, ACS, 1155—16th St., N.W., Washington, D.C. 20036. Back and current issues available on microfilm and microfiche. Rates on request from Microform Program, ACS.

Chemical & Engineering News (ISSN 0009-2347) is published weekly except for the last week in December by the American Chemical Society at 1155—16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices. POSTMASTER: Send address changes to Chemical & Engineering News, Membership & Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. ACS assumes no responsibility for the statements and opinions advanced by the contributors to its publications.

Advertising Management
CENTCOM LTD.
(For list of offices see page 55)

LETTERS

S.O.S. for chemists

SIR: The letter by Peter A. Reinhardt (C&EN, Sept. 7, page 4) citing the need for chemists to participate in the management of local chemical risks could not be more timely. Recently, the southbound section of the major freeway in San Diego was shut down for eight hours because a bag of iron oxide was spilled on the highway. The cleanup crew interpreted their Material Data Safety Sheets as classifying iron oxide as a toxic and hazardous substance. A member of the crew was quoted as saying that all powdered materials when mixed with air presented an explosive problem. A second crew member claimed skin blistering from handling the iron oxide. Apparently, not even a rudimentary knowledge of basic chemistry is required of crews charged with cleaning up chemical spills. One wonders how a really serious toxic spill would have been handled.

I suspect that this comedy of errors was not an isolated occurrence and that most communities are not better equiped to handle chemical hazards in a more intelligent manner. A major highway in the state of Washington was recently closed down for several hours because a bag of flour was scattered over the highway. To be fair, in the latter case, the cleanup crew did not know they were dealing with ordinary flour. The crew in San Diego justified their action by saying they had nowhere to turn to for advice on how to handle iron oxide. It would seem that chemists could be of help in their communities on such matters, even if only to the extent of making their telephone numbers available.

Harry Heller
Escondido, Calif.

Professional image

SIR: The remarks made by Jerry R. Mohrig from Carleton College (C&EN, Sept. 28, page 24) are arrogant and condescending as well as an insult to the tens of thousands of B.S. and M.S. chemists. According to Mohrig, all these B.S. and M.S. chemists are amateurs and mavericks, since they do not have a Ph.D. in their curriculum vitae.

However, I am glad to note that in the same issue an application form for membership in ACS asks: "Mr., Mrs., Ms., Miss, or Dr.?" as the means of address. It is therefore obvious that our professional organization does recognize the value and the professional contributions made by these maverick, amateur chemists.

What does Mohrig tell those students at Carleton College who do not complete a Ph.D. program? According to his own words these young men and women are mavericks if they enter the world as chemists.

This attitude is divisive and does not help the image of the profession in the world at large.

Horst Kehl
Lafayette, La.

Descend from Olympus

SIR: I have often thought of commenting on letters published in your magazine, but H. O. Ranger's letter, "Is lab regulation necessary?" (C&EN, Aug. 3, page 2) is the first to actually compel me to act. In it, the writer denigrates the need for lab regulation, stating that although compliance with regulatory standards may be reassuring "it will not save the life or increase the longevity of even the most naive and careless laboratory worker."

Ranger describes the "typical" chemical laboratory as a cross between Shangri-la and Utopia, a magical kingdom presided over by an omnipotent graduate chemist who not only has an "in-depth knowledge" of the "3000 to 5000 bottles of chemicals" surrounding him or her, but has the keen ability to train eager technicians, keep a watchful eye on careless ones, and is blessed with the divine wisdom of knowing when a person has reached the limit and should be reassigned to another, less-hazardous job. On top of all this, this paternal (or maternal) chemist must also have time to conduct meaningful research, keep current in his or her technological field, and, most important, keep abreast of new discoveries in the safety field.

If Ranger is that type of chemist, I extend my congratulations to him. Such people are hard to find. In fact, until recently most lived on a mountain in Greece known as Olympus. Being involved intimately in the chemical safety field for more than a decade, both in the laboratory and as a consultant, I can assure Ranger that few of these persons are working in laboratories today; most chemists are mere mortals trying to achieve Ranger's ideal, but often falling short. How many of us have never been careless or have never given our technicians incomplete, or even improper, in-

must be carefully nurtured in huge bioreactors.

"We want to replace the bioreactor with living animals," says Alan Smith, vice president and scientific director of Integrated Genetics. He points out that the transgenic mice produce grams of t-PA per liter of milk, whereas a typical bioreactor's output is in the range of milligrams per liter. In addition, the scientists think it would be cheaper to raise animals than to cater to notoriously temperamental cells in fermentation tanks.

Other commercially important substances might also be produced in the milk of transgenic animals. "We expect virtually any human protein could be expressed," says Katherine Gordon, head of Integrated Genetics' transgenic program. Key candidates in addition to t-PA include Factors VIII and IX, which are used to treat hemophiliacs, and certain industrially useful enzymes, she says. The firm estimates the market for such proteins to be in the billion-dollar range.

Transgenic animals, first produced seven years ago, are created by injecting genes from other species into single-cell embryos. The foreign DNA fuses with the animal's native DNA and is carried into every cell as the embryo grows and divides. Future generations of the animal inherit the foreign gene.

Although the gene for making human t-PA is present in all of the cells of the transgenic mice, the protein is only synthesized in the mammary gland. The researchers dictated where the t-PA would be made by fusing genes that normally control the production of mouse milk whey proteins to the gene for t-PA.

Getting milk from a mouse is not simple, so Integrated Genetics plans to produce transgenic cows, sheep, or goats that secrete human proteins in their milk. Because the biochemistry of milk from dairy animals is so well understood, use of these animals won't require major new studies, says Lothar Hennighousen of the National Institute of Diabetes & Digestive & Kidney Diseases. "A conservative estimate would be that we could make the world's supply of t-PA from a herd of 100 cows," Gordon says. □

Chemical stocks still ride Wall Street seesaw

For the second week in a row, the stock market continued its seesaw pattern last week, although the Dow Jones Industrial Average remained above its Oct. 19 low of 1738. Of the broader composite and industrial market indexes, most showed some recovery, if not stability. Only the American Stock Exchange Index and the over-the-counter indexes descended below their low closing values of Oct. 19.

This isn't to say that stocks aren't hurting. A group of 10 chemical company stocks followed by C&EN lost about 26% of their combined stock market value between Oct. 16, the last trading day before Black Monday, and Oct. 28. Other chemical-related groups did not fare so badly. For a group of five oil companies with chemical production facilities, the total market value fell only 11%. The stock value for a sampling of five pharmaceutical firms dropped 13%, and for a group of five diversified companies with large chemical interests the decline was 15%. Only the highly speculative biotechnology firms did worse than chemical companies; a group of five such firms lost 34% of their market value during the period.

Chemical firms don't seem particularly worried by the downturn in the market, with most downplaying it by pointing out that their stocks are a good buy right now. In fact, at one firm visited by C&EN, the talk among executives was more of what stocks to buy for their personal portfolios than of the detrimental effect that their company's stock drop will have.

Chemical executives are pretty uniform in saying that the downturn will have very little effect on the traditional chemical industry. Most companies are keeping capital spending in check by retrofitting and debottlenecking existing plants to the point that many of the capital expansions they will be undertaking can be financed internally. Thus there is no need for them to go to the equity or debt markets.

The chief fear on Wall Street seems to be that the drop in the market may signal a recession. However, quick surveys by a number of organizations show little or no change in consumer confidence. Thus, economists see little reason to change their forecasts for growth over the next 12 months. There may be some slowdown in new car purchases and in housing construction, but these were already under way, with auto sales down about 10% from year-earlier levels. Other consumer demand probably will hold up, the economists say. □

Market value of chemical stocks has fallen precipitously

$ Millions	Stock market value Oct. 16	Oct. 28	% change
Air Products	$2,530	$1,776	−29.8%
American Cyanamid	3,801	3,332	−12.3
Aristech	782	507	−35.2
Dow Chemical	16,914	12,685	−25.0
Ethyl	2,735	2,032	−25.7
W. R. Grace	2,513	1,697	−32.5
Hercules	3,128	2,504	−19.9
Monsanto	6,773	4,737	−30.1
Olin	1,147	763	−33.5
Union Carbide	3,581	2,457	−31.4
TOTAL TEN CHEMICAL FIRMS	$43,904	$32,490	−26.0%
FIVE OIL COMPANIES	$124,645	$111,393	−10.8%
FIVE DRUG COMPANIES	$62,208	$54,166	−12.9%
FIVE DIVERSIFIED COMPANIES	$37,258	$31,734	−14.8%
FIVE BIOTECHNOLOGY COMPANIES	$5,050	$3,312	−34.4%

Chlor-Alkali Capacity Use Hits Record High for Decade

First major plant expansion in several years signals efforts of producers to ease tight supplies and to meet renewed growth in demand

Bruce F. Greek, C&EN Houston

Near Niagara Falls, N.Y., next month, a joint venture of Olin and Du Pont—Niachlor—will start up an electrolysis plant to make about 660 tons per day each of chlorine and sodium hydroxide (caustic soda). The plant will be a major capacity expansion, the first in several years for the chlor-alkali industry.

Other capacity for the chlor alkalies has been expanded slightly this year through debottlenecking programs. Producers have been prompted to operate plants very close to capacity for a year or so in the face of strengthening demand and forecasts for demand to remain strong.

The Niachlor plant will add very little to 1987 available capacity but will be fully available in 1988 along with capacity from other expansions slated to be completed next year. For example, Dow Chemical has begun an extensive debottlenecking program at some of its plants at Freeport, Tex., that will add 550 tons per day of chlorine capacity in increments through the second quarter of 1988. Occidental Chemical also is working to restart (during the second quarter of 1988) a chlorine-caustic plant at Corpus Christi, Tex., which it acquired from Du Pont this fall.

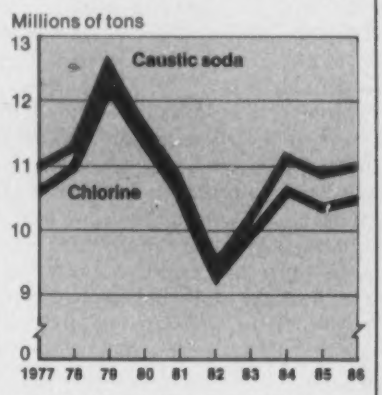
The Niachlor plant capacity and the effect of debottlenecking efforts by Dow and other chlorine producers (as well as the capacity of plants mothballed or temporarily shut down) will provide U.S. capacity of more than 36,000 tons per day of chlorine, or about 13 million tons per year, by next January. U.S. daily capacity has not exceeded 36,000 tons since July 1986, according to the monthly report of the Chlorine Institute, the chlor-alkali industry's trade association. The Chlorine Institute estimates that, as of August this year, 4150 tons per day of chlorine capacity was either mothballed or temporarily shut down.

Production of chlorine in 1987 likely will total about 10.9 million tons, up about 3% from last year. Caustic soda production as usual will be 4 to 5% higher than chlorine production, or 11.4 million tons this year.

Operable chlorine capacity, estimated by the Chlorine Institute to be more than 35,250 tons per day in August, remains below its historical highs of more than 40,000 tons per day during some months in 1982. In 1982 and other years between 1980 and 1985, plant operating rates fell to low levels—70 to 80% of operating capacity—well below the traditional level of about 95%.

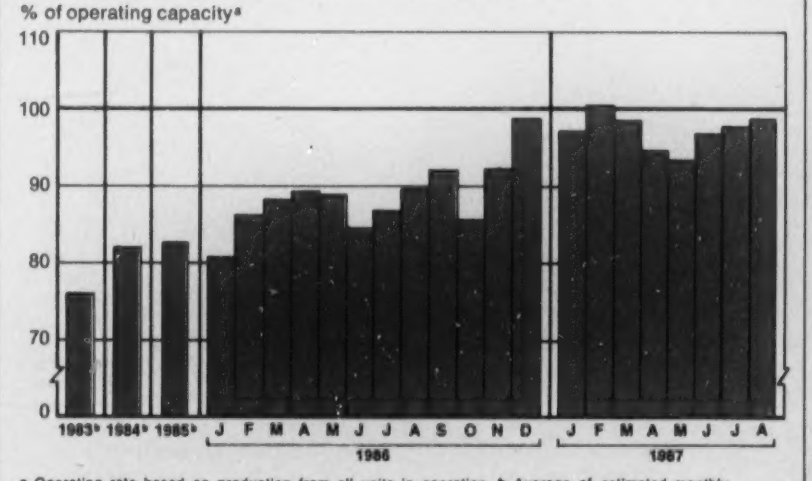
To solve the problem of excess

Chlorine, caustic output remains below record high



Sources: Chlorine Institute, Department of Commerce

Plant operating rates reach effective capacity



a Operating rate based on production from all units in operation. b Average of estimated monthly effective rates. **Sources:** Chlorine Institute, C&EN estimates

capacity and the costly low operating rates, producers adopted a program of scrapping many older units. Last month in a presentation to the Mexican chemical industry association (ANIQ), Frank H. Romanelli, executive vice president of Occidental Chemical, estimated that 20 U.S. chlorine plants with a capacity of 8700 tons per day were closed in the 1980s by 17 different companies. He pointed out that that amount of capacity exceeds Occidental's current capacity, which is now second largest in the industry. Part of the capacity reduction was offset by minor capacity additions through process and technology improvements.

Most of the plants that have been shut down had relatively small capacities, 435 tons per day on average. Some of those small plants were operated by companies that had a captive use for the products, such as in pulp and paper manufacturing. Energy costs began climbing in the 1970s, making small units less and less competitive and shifting the make-versus-buy option toward buying chlor-alkalies. Few of the small plants are still operating, and industry sources expect them to be shut down as large-volume producers continue to improve their technology and cut their production costs significantly.

Following several of the plant shutdowns, demand for both chlorine and soda began to improve markedly in late 1985. And now operating capacity is running at about the traditional level of above 95%. Operations in February of this year, for instance, were 100.5% of the then-operating capacity of 35,150 tons per day, the Chlorine Institute estimates. In August, the rate was 98.5% of some 35,250 tons per day of operating capacity.

The strong demand for chlor-alkalies and the capacity reductions have triggered a series of increases in their off-list prices this year. List prices remain about $200 per ton for either chlorine or caustic soda. During the past year, selling prices have moved up to $150 per ton from as low as $100 per ton. If the economy holds, prices will remain firm, according to industry sources.

Longer term demand for chlorine is forecast to grow 1 to 2% annually, for caustic soda 1 to 3%. The wider range forecast for growth in caustic use results from the uncertainties in the export market for caustic. With relatively small capacity increases expected, plants likely will operate at about present levels in 1988 to meet the small demand increase.

Most of the growth in consumption of chlorine will stem from what is currently its fastest-growing use—in the production of ethylene dichloride, a precursor for polyvinyl chloride. This use accounts for nearly 25% of U.S. chlorine consumption and is growing at about three times the rate of total chlorine consumption. U.S. PVC demand is sensitive to the economy because such a large share eventually goes into housing and commercial construction. Demand for PVC in pipe is increasing with the increasing use of large-diameter pipe (which consumes much larger quantities of resin per foot) in sewer systems.

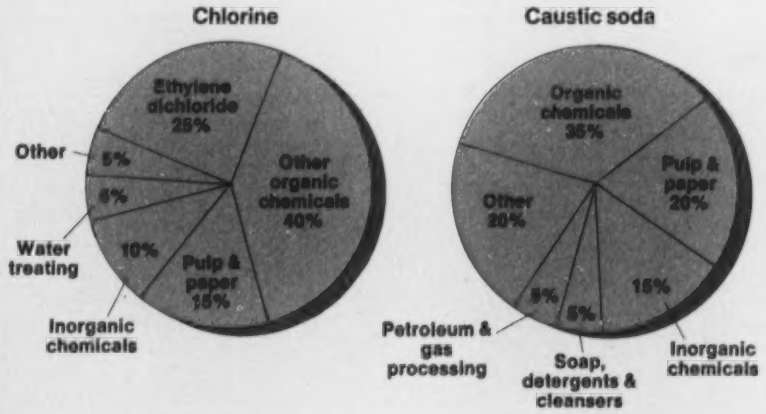
Other markets for chlorine are growing more slowly. Chlorine use in making inorganic chemicals may rise 1 to 2% annually, pushed by demand for making titanium dioxide. Use in manufacture of organic chemicals may decline slightly because of lower demand for chlorinated organic solvents. Applications in water treatment will grow slowly, as will use in pulp and paper making where competition from other bleaching materials remains strong.

Growth in the use of caustic soda, although stronger than for chlorine, still depends heavily on exports. Exports this year are expected to remain about 1.3 million tons. Net exports likely will decline, however, because of rising imports. Strong U.S. demand for caustic for making pulp and paper and organic chemicals, as well as many small miscellaneous uses, appears to be absorbing imported caustic.

Caustic will continue to face competition from soda ash (sodium carbonate), according to Roger E. Shamel, president of Consulting Resources of Lexington, Mass. As selling prices of caustic rise, consumers with plants that can use either caustic or soda ash for sodium oxide values will shift toward use of soda ash. Recent price increases for soda ash stem from strong export demand and currently make the likelihood of much of a shift slim.

If demand for chlorine and caustic soda continues strong in 1988, as now is expected, this segment of the chemical industry likely will have another good year of production at high levels. Uncertainty of the availability of mothballed capacity, which is more than 10% of operating capacity, has put a damper on plans to add capacity other than through process debottlenecking. □

Chlorine and caustic soda have diverse uses



a Includes net imports of 250,000 tons. b Excludes net exports of 600,000 tons.

Reinforced plastics use to pick up momentum

Use of reinforced plastics will grow faster through the rest of this decade than it did in the 1977-86 period, according to a new study by the Freedonia Group, the Cleveland, Ohio-based market research firm.

The study indicates that reinforced plastics demand in the U.S. will increase 5.5% per year to reach 3.2 billion lb in 1991. At that time they will make up about 5.4% of all plastics demand, compared with 5.0% in 1986. By 1995, demand for reinforced plastics will grow to 3.9 billion lb and make up 5.7% of all plastic use. The percentage, however, is still below the 5.8% of all plastics demand posted in 1977.

Reinforced thermoplastics demand will grow about three times as fast by 1991 as that for reinforced thermosets, according to the 105-page study. The study projects demand for thermosets to grow 3.7% per year between 1986 and 1991 to reach 2.3 billion lb, and thermoplastic demand will rise at an average annual rate of 11.1% per year to 900 million lb.

Thermoplastics are the fastest growing segment as a result of their freedom of design, reprocessing abilities, and improved processing techniques, the company says. New developments in blending and compounding, combined with technological advances, will raise demand for reinforced thermoplastics. Nylon and polypropylene are the dominant resins among the thermoplastics, but thermoplastic polyester will be the fastest growing at an annual rate of 16.4%, according to the study.

Among markets for reinforced plastics, increased use of sheer molding compounds is anticipated despite major cutbacks in plastic car body programs by major auto makers. The greatest opportunities will lie in exterior body panels, bumpers, and underhood parts.

Freedonia Group sees the aircraft and aerospace industries as the most rapidly growing market outlet for reinforced plastics, although use in those industries is currently still small. Construction will remain a large market because of cost and performance advantages over competing materials.

Growth in demand for reinforcement materials also will be about 5.5% through 1991. Glass fiber will maintain its dominance, accounting for about 93% of reinforcement materials use. Carbon and other high-performance reinforcing materials will experience the most growth, as the market for advanced composites expands.

Copies of the report can be obtained from Freedonia Group, 2940 Noble Rd., Suite 200, Cleveland, Ohio, 44121, at a cost of $1600.

William Storck, New York

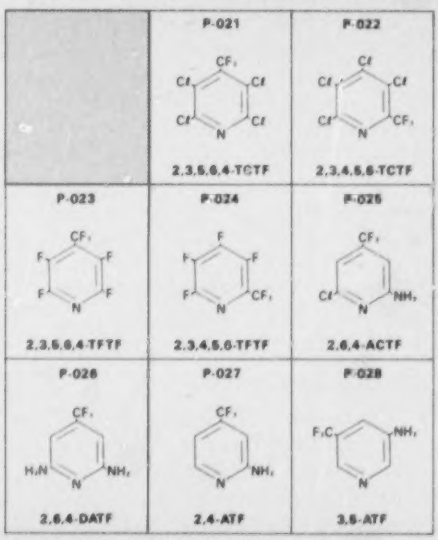
Reinforced plastics demand will hit 3.9 billion lb by 1995

Millions of lb	1977	1986	1991	1995	% annual change 1977-86	% annual change 1986-91
Reinforced thermosets	**1619**	**1914**	**2300**	**2600**	**1.9%**	**3.7%**
Polyester	1539	1781	2136	2410	1.6	3.7
Epoxy	45	69	85	100	4.9	4.3
Other	35	64	79	90	6.9	4.3
Reinforced thermoplastics	**191**	**532**	**900**	**1300**	**12.1**	**11.1**
Nylon	38	146	210	265	16.1	7.5
Polypropylene	68	142	243	370	8.5	11.3
Polyester	34	117	250	385	14.7	16.4
Styrenics	30	49	72	97	5.6	8.0
Polycarbonate	—	45	82	130	—	12.8
Other	21	33	43	53	5.2	5.4
TOTAL	**1810**	**2446**	**3200**	**3900**	**3.4%**	**5.5%**

Source: Freedonia Group

Organic Intermediates through Ishihara Sangyo's Advanced Technology:

NEW PYRIDINE DERIVATIVES



ISHIHARA SANGYO has added the above new compounds to its product line. Although these new developmental compounds are only in the research stage, small samples can be prepared for research and development purposes. We wish to make the best use of our processes to assist in the synthesis of your products.

ISHIHARA SANGYO KAISHA, LTD.
10-30, Fujimi 2-Chome, Chiyoda-ku, Tokyo, Japan. Telex 2324306 ISK J
ISK (EUROPE) S.A. 33-31 Rue Montoyer, Box 8 1040 Bruxelles
Tel (02)512-54-50-512-72-78 Telex 23362 ITDD B
ISHIHARA CORPORATION (U.S.A.) Transamerica Pyramid 42nd Floor 600 Montgomery Street, San Francisco, Ca. 94111
Tel 415-421-8207 Telex 278010 ICUSA UR —